What is claimed is:

1. A bipolar battery, comprising:

at least one bipolar electrode in which a positive electrode active material layer is formed on one surface of a collector, and a negative electrode active material layer is formed on another surface of the collector; and

at least one electrolyte layer placed between the bipolar electrodes,

wherein any one of the positive electrode active material layer and the negative electrode active material layer is made of a changeable electrode active material, and the other is made of an unchangeable electrode active material,

the changeable electrode active material is an active material having a characteristic in which, once a maximum charging capacity of the changeable electrode active material is almost reached during charge, a change in voltage of the changeable electrode active material becomes greater than that before the maximum charging capacity thereof is almost reached, and

the unchangeable electrode active material is an active material having a characteristic in which, even when the maximum charging capacity of the changeable electrode active material is almost reached during the charge, a voltage of the unchangeable electrode active material is almost the same as that before the maximum charging capacity of the changeable electrode active material is almost reached.

2. A bipolar battery according to claim 1,

wherein a charging capacity of the unchangeable electrode active material is 110% or more relative to the charging capacity of the changeable electrode active material.

3. A bipolar battery according to claim 1,

wherein a single cell layer is made of the positive electrode active material layer, the electrolyte layer and the negative electrode active material layer,

a completion voltage with which the charge of the single cell layer is recognized as completed is decided on the basis of the characteristic of the

change in voltage of the changeable electrode active material, and

during the charge, whether or not the charge is completed is judged on the basis of the completion voltage.

4. A bipolar battery according to claim 3,

wherein the changeable electrode active material is spinel lithium manganate included in the positive electrode active material layer, and the unchangeable electrode active material is lithium titanate included in the negative electrode active material layer, and

the completion voltage is decided within a range from 2.7V to 3.0V.

5. A bipolar battery according to claim 3,

wherein the changeable electrode active material is spinel lithium manganate included in the positive electrode active material layer, and the unchangeable electrode active material is graphite included in the negative electrode active material layer, and

the completion voltage is decided within a range from 4.2V to 4.5V.

6. A bipolar battery according to claim 3,

wherein the changeable electrode active material is lithium titanate included in the negative electrode active material layer, and the unchangeable electrode active material is spinel lithium manganate included in the positive electrode active material layer, and

the completion voltage is decided within a range from 2.7V to 3.0V.

7. A bipolar battery according to claim 1,

wherein the electrolyte layer is constituted of a solid polymer electrolyte.

8. An assembled battery, comprising:

a plurality of bipolar battery,

the bipolar battery, comprising:

at least one bipolar electrode in which a positive electrode active material layer is formed on one surface of a collector, and a negative electrode active material layer is formed on another surface of the collector; and

at least one electrolyte layer placed between the bipolar electrodes,

wherein any one of the positive electrode active material layer and the negative electrode active material layer is made of a changeable electrode active material, and the other is made of an unchangeable electrode active material,

the changeable electrode active material is an active material having a characteristic in which, once a maximum charging capacity of the changeable electrode active material is almost reached during charge, a change in voltage of the changeable electrode active material becomes greater than that before the maximum charging capacity thereof is almost reached, and

the unchangeable electrode active material is an active material having a characteristic in which, even when the maximum charging capacity of the changeable electrode active material is almost reached during the charge, a voltage of the unchangeable electrode active material is almost the same as that before the maximum charging capacity of the changeable electrode active material is almost reached.

9. A charge control system, comprising:

a bipolar battery including at least one bipolar electrode in which a positive electrode active material layer is formed on one surface of a collector and a negative electrode active material layer is formed on another surface of the collector, and at least one electrolyte layer placed between the bipolar electrodes;

an electric power supply unit which supplies electric power to the bipolar battery;

a measuring unit which measures a voltage of the bipolar battery when electric power supply by the electric power supply unit is stopped; and

a control unit which controls the supply or stopping of supply of the electric power by the electric power supply unit on the basis of a measurement

result by the measuring unit,

wherein any one of the positive electrode active material layer and the negative electrode active material layer is made of a changeable electrode active material, and the other is made of an unchangeable electrode active material,

the changeable electrode active material is an active material having a characteristic in which, once a maximum charging capacity of the changeable electrode active material is almost reached during charge, a change in voltage of the changeable electrode active material becomes greater than that before the maximum charging capacity thereof is almost reached, and

the unchangeable electrode active material is an active material having a characteristic in which, even when the maximum charging capacity of the changeable electrode active material is almost reached during the charge, a voltage of the unchangeable electrode active material is almost the same as that before the maximum charging capacity of the changeable electrode active material is almost reached.

10. A charge control system, comprising:

an assembled battery having a bipolar battery including at least one bipolar electrode in which a positive electrode active material layer is formed on one surface of a collector and a negative electrode active material layer is formed on another surface of the collector, and at least one electrolyte layer placed between the bipolar electrodes;

an electric power supply unit which supplies electric power to the bipolar battery;

a measuring unit which measures a voltage of the bipolar battery when electric power supply by the electric power supply unit is stopped; and

a control unit which controls the supply or stopping of supply of the electric power by the electric power supply unit on the basis of a measurement result by the measuring unit,

wherein any one of the positive electrode active material layer and the negative electrode active material layer is made of a changeable electrode active material, and the other is made of an unchangeable electrode active material,

the changeable electrode active material is an active material having a characteristic in which, once a maximum charging capacity of the changeable electrode active material is almost reached during charge, a change in voltage of the changeable electrode active material becomes greater than that before the maximum charging capacity thereof is almost reached, and

the unchangeable electrode active material is an active material having a characteristic in which, even when the maximum charging capacity of the changeable electrode active material is almost reached during the charge, a voltage of the unchangeable electrode active material is almost the same as that before the maximum charging capacity of the changeable electrode active material is almost reached.

11. A charge control system according to claim 9,

wherein a single cell layer is made of the positive electrode active material layer, the electrolyte layer and the negative electrode active material layer, and

the control unit judges whether or not the charge is completed on the basis of a completion voltage with which the charge of the single cell layer is recognized as completed, the completion voltage being decided on the basis of the characteristic of the change in voltage of the changeable electrode active material, and

the control unit adjusts a state of charge of each of the single cell layers by controlling the electric power supply unit.

12. A charge control system according to claim 11,

wherein the control unit judges whether or not the charge is completed on the basis of a voltage obtained by multiplying the completion voltage by the number of the single cell layers stacked in the bipolar battery.

13. A vehicle, comprising:

a bipolar battery including at least one bipolar electrode in which a positive electrode active material layer is formed on one surface of a collector,

and a negative electrode active material layer is formed on another surface of the collector; and at least one electrolyte layer placed between the bipolar electrodes,

wherein any one of the positive electrode active material layer and the negative electrode active material layer is made of a changeable electrode active material, and the other is made of an unchangeable electrode active material,

the changeable electrode active material is an active material having a characteristic in which, once a maximum charging capacity of the changeable electrode active material is almost reached during charge, a change in voltage of the changeable electrode active material becomes greater than that before the maximum charging capacity thereof is almost reached, and

the unchangeable electrode active material is an active material having a characteristic in which, even when the maximum charging capacity of the changeable electrode active material is almost reached during the charge, a voltage of the unchangeable electrode active material is almost the same as that before the maximum charging capacity of the changeable electrode active material is almost reached.

14. A vehicle, comprising:

a charge control system comprising:

a bipolar battery including at least one bipolar electrode in which a positive electrode active material layer is formed on one surface of a collector and a negative electrode active material layer is formed on another surface of the collector, and at least one electrolyte layer placed between the bipolar electrodes;

an electric power supply unit which supplies electric power to the bipolar battery;

a measuring unit which measures a voltage of the bipolar battery when electric power supply by the electric power supply unit is stopped; and

a control unit which controls the supply or stopping of supply of the electric power by the electric power supply unit on the basis of a

measurement result by the measuring unit,

wherein any one of the positive electrode active material layer and the negative electrode active material layer is made of a changeable electrode active material, and the other is made of an unchangeable electrode active material,

the changeable electrode active material is an active material having a characteristic in which, once a maximum charging capacity of the changeable electrode active material is almost reached during charge, a change in voltage of the changeable electrode active material becomes greater than that before the maximum charging capacity thereof is almost reached, and

the unchangeable electrode active material is an active material having a characteristic in which, even when the maximum charging capacity of the changeable electrode active material is almost reached during the charge, a voltage of the unchangeable electrode active material is almost the same as that before the maximum charging capacity of the changeable electrode active material is almost reached.

15. A charge control system, comprising:

a bipolar battery including at least one bipolar electrode in which a positive electrode active material layer is formed on one surface of a collector and a negative electrode active material layer is formed on another surface of the collector, and at least one electrolyte layer placed between the bipolar electrodes;

electric power supply means for supplying electric power to the bipolar battery;

measuring means for measuring a voltage of the bipolar battery when electric power supply by the electric supply means is stopped; and

control means for controlling the supply or stopping of supply of the electric power by the electric power supply means on the basis of a measurement result by the measuring means,

wherein any one of the positive electrode active material layer and the negative electrode active material layer is made of a changeable electrode active material, and the other is made of an unchangeable electrode active material,

the changeable electrode active material is an active material having a characteristic in which, once a maximum charging capacity of the changeable electrode active material is almost reached during charge, a change in voltage of the changeable electrode active material becomes greater than that before the maximum charging capacity thereof is almost reached, and

the unchangeable electrode active material is an active material having a characteristic in which, even when the maximum charging capacity of the changeable electrode active material is almost reached during the charge, a voltage of the unchangeable electrode active material is almost the same as that before the maximum charging capacity of the changeable electrode active material is almost reached.

16. A charge control system, comprising:

an assembled battery having a bipolar battery including at least one bipolar electrode in which a positive electrode active material layer is formed on one surface of a collector and a negative electrode active material layer is formed on another surface of the collector, and at least one electrolyte layer placed between the bipolar electrodes;

electric power supply means for supplying electric power to the bipolar battery;

measuring means for measuring a voltage of the bipolar battery when electric power supply by the electric supply means is stopped; and

control means for controlling the supply or stopping of supply of the electric power by the electric power supply means on the basis of a measurement result by the measuring means,

wherein any one of the positive electrode active material layer and the negative electrode active material layer is made of a changeable electrode active material, and the other is made of an unchangeable electrode active material,

the changeable electrode active material is an active material having a characteristic in which, once a maximum charging capacity of the changeable electrode active material is almost reached during charge, a change in voltage of the changeable electrode active material becomes greater than that before the

maximum charging capacity thereof is almost reached, and

the unchangeable electrode active material is an active material having a characteristic in which, even when the maximum charging capacity of the changeable electrode active material is almost reached during the charge, a voltage of the unchangeable electrode active material is almost the same as that before the maximum charging capacity of the changeable electrode active material is almost reached.